

What is claimed is:

- 1 1. A cryogenic medical system comprising:
2 a medical device;
3 a console including accessories, the console connectable to the medical device at a
4 connection point, the console controlling temperature of the medical device, and the
5 console including
6 a first cooling system directing coolant to the medical device at a first
7 temperature along a coolant supply line; and
8 a second cooling system chilling the coolant within the coolant supply line
9 to a temperature below the first temperature before the coolant reaches the connection
10 point.
- 1 2. The system of claim 1, wherein the medical device includes a catheter.
- 1 3. The system of claim 2, wherein the first cooling system includes a coolant return
2 line leading from the medical device, and wherein the first cooling system and the
3 medical device comprise a substantially closed-loop.
- 1 4. The system of claim 3, wherein the first cooling system includes:
2 a first compressor in fluid communication with a first condenser outputting
3 coolant into the coolant supply line; and
4 a vacuum pump in fluid communication with the first compressor that establishes
5 a pressure within the coolant return line that is below ambient atmospheric pressure.
- 1 5. The system of claim 3, wherein the second cooling system includes an enclosure
2 having an inlet and an outlet; the enclosure defining a fluid path from the inlet to the
3 outlet, and the enclosure enveloping a portion of the coolant supply line.

1 6. The system of claim 5, further comprising a second compressor in fluid
2 communication with a second condenser outputting coolant to the inlet of the enclosure
3 and receiving coolant from the outlet of the enclosure.

1 7. The system of claim 2, wherein the first cooling system includes a coolant return
2 line leading from the catheter to a coolant scavenging system, and wherein the first
3 cooling system and the catheter comprise a substantially open-loop.

1 8. The system of claim 7, wherein the first cooling system includes:
2 a coolant reservoir in fluid communication with the fluid supply line; and
3 a vacuum pump interposed between the catheter and the coolant collection tank.

1 9. The system of claim 8, wherein the vacuum pump creates a pressure within the
2 catheter that is below ambient atmospheric pressure.

1 10. The system of claim 7, wherein the second cooling system includes an enclosure
2 having an inlet and an outlet; the enclosure defining a fluid path from the inlet to the
3 outlet, and the enclosure enveloping a portion of the coolant supply line.

1 11. The system of claim 10, further comprising a compressor in fluid communication
2 with a condenser outputting coolant to the inlet of the enclosure and receiving coolant
3 from the outlet of the enclosure.

1 12. The system of claim 10, further comprising:

2 a coolant reservoir in fluid communication with the fluid supply line;

3 a second fluid supply line in fluid communication with the coolant reservoir and
4 the inlet of the enclosure.

1 13. The system of claim 12, further comprising:

2 a temperature sensor for measuring the temperature within the enclosure; and

3 a coolant flow regulator responsive to the temperature sensor for controlling fluid
4 flow from the second fluid supply line into the enclosure.

1 14. The system of claim 12, further comprising a temperature sensor for measuring
2 the temperature within the fluid supply line; and

3 a coolant flow regulator responsive to the temperature sensor for controlling fluid
4 flow from the second fluid supply line into the enclosure.

1 15. A cryogenic medical system comprising:

2 a catheter;

3 a console including accessories, the console connectable to the catheter at a
4 connection point, the console controlling temperature of the catheter, and the console
5 including

6 a first cooling system including

7 a coolant supply line leading to the catheter,

8 a coolant return line leading from the catheter,

9 a first compressor in fluid communication with a first condenser
10 outputting coolant into the coolant supply line, and

11 a vacuum pump in fluid communication with the first compressor
12 that establishes a pressure within the coolant return line that is below ambient
13 atmospheric pressure; and

14 a second cooling system including

15 an enclosure having an inlet and an outlet, wherein the enclosure
16 defines a fluid path from the inlet to the outlet, and the enclosure envelops a portion of
17 the coolant supply line of the first cooling system; and

18 a second compressor in fluid communication with a second
19 condenser outputting coolant to the inlet of the enclosure and receiving coolant from the
20 outlet of the enclosure.

1 16. A cryogenic medical system comprising:

2 a catheter;

3 a console including accessories, the console connectable to the catheter at a
4 connection point, the console controlling temperature of the catheter, and the console
5 including

6 a first cooling system including

7 a coolant supply line leading to the catheter,

8 a coolant return line leading from the catheter,

9 a coolant reservoir in fluid communication with the fluid supply
10 line,

11 a coolant collection tank in fluid communication with the coolant
12 return line, and

13 a vacuum pump interposed between the catheter and the coolant
14 collection tank that establishes a pressure within the coolant return line below ambient
15 atmospheric pressure; and

16 a second cooling system including

17 an enclosure having an inlet and an outlet, wherein the enclosure
18 defines a fluid path from the inlet to the outlet, and the enclosure envelops a portion of
19 the coolant supply line of the first cooling system; and

20 a second fluid supply line in fluid communication with the coolant
21 reservoir and the inlet of the enclosure.

1 17. A cryogenic medical system comprising:

2 a medical device;

3 a console including accessories, the connectable to the medical device at a
4 connection point, the console controlling temperature of the medical device, and the
5 console including

6 a first system directing coolant in a mixed gas and liquid state to the
7 medical device along a coolant supply line; and

8 a second system decreasing the percentage of gas in the coolant before the
9 coolant reaches the connection point.

1 18. The system of claim 17, wherein the second system decreases the percentage of
2 gas in the coolant by reducing the temperature of the coolant, and wherein the system
3 further comprises

4 an chamber having an inlet and an outlet, wherein the enclosure defines a fluid
5 path from the inlet to the outlet, and the enclosure envelops a portion of the coolant
6 supply line; and

7 a controller for controlling coolant flow into the chamber.

1 19. The system of claim 18, wherein the controller establishes a duty cycle for
2 cyclically allowing and denying entry of coolant into the chamber at a rate responsive to
3 sensed temperature within the chamber to selectively raise, lower, and maintain
4 temperature of coolant within the coolant supply line.